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600 Technology Park Drive
Billerica, MA 01821-4130

T1/FT1 Adapter Module
Supplement

NORTEL NETWORKS™

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to take whatever measures may be necessary to correct the interference at their own expense.

European Requirements Only

EN 55 022 Statement

This is to certify that the Nortel Networks T1/FT1 adapter module is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class A (CISPR 22).

Warning: This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

Achtung: Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Attention: Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.

To maintain compliance with FCC radio frequency emission limits, shielded cables are required to connect equipment to other Class A certified devices and the use of quadshield, RG-6/U type CATV cable is required for connection to the CATV system. Any changes or modifications may void the user's authorization to operate this equipment.

EC Declaration of Conformity

This product conforms (or these products conform) to the provisions of Council Directive 89/336/EEC and 73/23/EEC. Go to *http://libra2.corpwest.baynetworks.com/cgi-bin/ndCGI.exe/DocView/* on the Nortel Networks World Wide Web site for a copy of the Declaration of Conformity.

Japan/Nippon Requirements Only

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Canada Requirements Only

Canadian Department of Communications Radio Interference Regulations

This digital apparatus (T1/FT1 adapter module) does not exceed the Class A limits for radio-noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

Règlement sur le brouillage radioélectrique du ministère des Communications

Cet appareil numérique (T1/FT1 adapter module) respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada.

Canada Requirements Only *(continued)*

Canada CS-03 Rules and Regulations

Notice: The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent the degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Notice: For equipment using loopstart lines, please note that the Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5. The REN is located on the "FCC Rules Part 68" label located on the bracket of the module, or on the back of the unit.

Canada CS-03 -- Règles et règlements

Avis: L'étiquette d'Industrie Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme aux normes de protection, d'exploitation et de sécurité des réseaux de télécommunications, comme le prescrivent les documents concernant les exigences techniques relatives au matériel terminal. Le Ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunication. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêche pas la dégradation du service dans certaines situations.

Les réparations de matériel homologué doivent être coordonnées par un représentant désigné par le fournisseur. L'entreprise de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

Avertissement: L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours à un service d'inspection des installations électriques, ou à un électricien, selon le cas.

Avis: Veuillez prendre note que pour tout appareillage supportant des lignes de type "loopstart," l'indice d'équivalence de la sonnerie (IES) assigné à chaque dispositif terminal indique le nombre maximal de terminaux qui peuvent être raccordés à une interface. La terminaison d'une interface téléphonique peut consister en une combinaison de quelques dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excède pas 5. Le REN figure sur l'étiquette "FCC Rules Part 68" située sur le support du module ou à l'arrière de l'unité.

FCC Part 68 Compliance Statement

This equipment complies with Part 68 of FCC Rules. All direct connections to telephone network lines must be made using standard plugs and jacks compliant with FCC Part 68. Please note the following:

1. You are required to request service from the telephone company before you connect the unit to a network. When you request service, you must provide the telephone company with the following data:

   - When you request T1 Service, you must provide the telephone company with
     -- The Facility Interface Code

        Provide the telephone company with all the codes below:

        - 04DU9-BN (1.544 MB, D4 framing format)
        - 04DU9-DN (1.544 MB, D4 framing format with B8ZF coding)
        - 04DU9-1KN (1.544 MB, ESF framing format)
        - 04DU9-1SN (1.544 MB, ESF framing format with B8ZF coding)
        - 04DU9-1ZN (1.544 MB, ANSI ESF and ZBTSI without line power)

        The telephone company will select the code it has available.

     -- The Service Order Code(s) (SOC): 6.0F

     -- The required Universal Service Order Code (USOC) jack: RJ48C

   - When you request 56K/64K Service, you must provide the telephone company with
     -- The Facility Interface Code: 04DU5-56/64

     -- The Service Order Code(s) (SOC): 6.0F

     -- The required Universal Service Order Code (USOC) jack: RJ48S

   - When you request V.34 Service, you must provide the telephone company with
     -- The required Universal Service Order Code (USOC) jack: RJ11C

     -- The make, model number, Ringer Equivalence Number (REN), and FCC Registration number of the unit

     The REN helps you determine the number of devices you can connect to your telephone line and still have all of those devices ring when your number is called. In most, but not all, areas, the sum of the RENs of all devices should not exceed 5.0. To be certain of the number of devices you can connect to your line, you should call your local telephone company to determine the maximum REN for your calling area. This equipment must not be used on party lines or coin lines.

   - When you request ISDN “U” Interface Service, you must provide the telephone company with
     -- The Facility Interface Code: 02IS5

     -- The Service Order Code(s) (SOC): 6.0F

     -- The required Universal Service Order Code (USOC) jack: RJ49C

   - When you request ISDN “S/T” Interface Service, you must provide the telephone company with
     -- The Service Order Code(s) (SOC): 6.0N

     -- The make, model number, and FCC Registration number of the NT1

     Note: ISDN S/T cannot be directly connected to the network.

- When you request Primary Rate ISDN Service, you must provide the telephone company with
  - -- The Facility Interface Code: 04DU9-1SN (1.544 MB, ESF framing format with B8ZF coding)
  - -- The Service Order Code(s) (SOC): 6.0F
  - -- The required Universal Service Order Code (USOC) jack: RJ48C

2. Your telephone company may make changes to its facilities, equipment, operations, or procedures that could affect the proper functioning of your equipment. The telephone company will notify you in advance of such changes to give you an opportunity to maintain uninterrupted telephone service.
3. If the unit causes harm to the telephone network, the telephone company may temporarily discontinue your service. If possible, they will notify you in advance, but if advance notice is not practical, you will be notified as soon as possible and will be informed of your right to file a complaint with the FCC.
4. If you experience trouble with the unit, please contact the Nortel Networks Technical Solutions Center in your area for service or repairs. Repairs should be performed only by service personnel authorized by Nortel Networks.

United States	1-800-2LANWAN
Valbonne, France	33-4-92-96-69-68
Sydney, Australia	61-2-9927-8800
Tokyo, Japan	81-3-5740-1700

5. You are required to notify the telephone company when you disconnect the unit from the network.

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Preface

The T1/FT1 adapter module provides high-speed connectivity to the digital services networks in North America. It is capable of operating at fractional T1 rates, in increments of 64 Kb/s, up to 1.544 Mb/s.

Before You Begin

This guide is intended for qualified service personnel who are installing the T1/FT1 adapter module in an AN®/ANH™, ARN™, Passport™ 5430, or Passport 2430 for the first time or who need to install or replace any customer-replaceable unit (CRU). A qualified service person should have appropriate technical training and experience and be aware of the hazards involved in installing and replacing CRUs.

For information on how to install the T1/FT1 adapter module in the Passport 4460, refer to *Reference for Passport 4460 Hardware.*

How to Use This Supplement

This WAN adapter module can be used with several different platforms. Refer to the table below to find the chapter that contains the information appropriate for the platform you are using.

Platform	**Refer to**
AN or ANH	Chapter 1
ARN	Chapter 2
Passport 5430	Chapter 3
Passport 2430	Chapter 4

Text Conventions

This guide uses the following text conventions:

bold text
Indicates command names and options and text that you need to enter.

Example: Use the **diags** command.

italic text
Indicates new terms, book titles, and variables in command syntax descriptions. Where a variable is two or more words, the words are connected by an underscore.

Example: If the command syntax is:
show at <*valid_route*>
valid_route is one variable and you substitute one value for it.

Acronyms

This guide uses the following acronyms:

CRU	customer-replaceable unit
ERC	express routing code
IP	Internet Protocol
PROM	programmable read-only memory
WAN	wide area network

Hard-Copy Technical Manuals

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If you purchased a Nortel Networks service program, contact one of the following Nortel Networks Technical Solutions Centers:

Technical Solutions Center	Telephone
EMEA	(33) (4) 92-966-968
North America	(800) 2LANWAN or (800) 252-6926
Asia Pacific	(61) (2) 9927-8800
China	(800) 810-5000

An Express Routing Code (ERC) is available for many Nortel Networks products and services. When you use an ERC, your call is routed to a technical support person who specializes in supporting that product or service. To locate an ERC for your product or service, go to the www12.nortelnetworks.com/ URL and click ERC at the bottom of the page.

Chapter 1
Using the T1/FT1 Adapter Module in a BayStack AN or ANH Router

This chapter supplements *Installing an Adapter Module in a BayStack™ AN or ANH Router.* Follow the hardware installation steps in that manual, then refer to this document for information specific to the T1/FT1 adapter module.

Verifying AN/ANH Router Requirements

Table 1-1 shows the minimum boot and diagnostic programmable read-only memory (PROM) code required for the T1/FT1 adapter modules.

Table 1-1. PROM Diagnostic and Boot Code for AN/ANH Routers

Code Type	Minimum Version	Directory	File Name
Boot	9.00c	an_proms	anboot.exe
Diagnostic	7.30	an_proms	andiag.exe

For information on upgrading PROM, see the BayRS™ *Upgrading Routers* guide.

Attaching Cables

Connect the T1 communication device cable to the RJ-48C connector on the installed T1/FT1 adapter module (Figure 1-1).

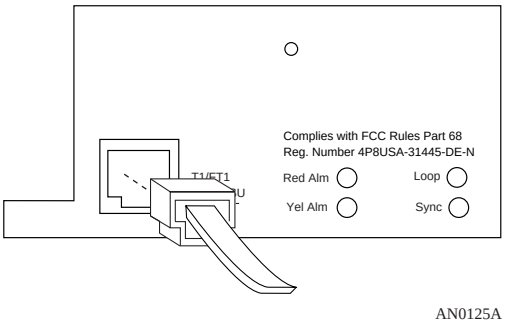

Figure 1-1. T1/FT1 Adapter Module Cable Connection and LEDs

You install the T1/FT1 adapter module in an open adapter module slot on the router, as follows:

- AN or 12-port ANH -- the back-panel adapter module slot (Figure 1-2). See *Installing an Adapter Module in a BayStack AN or ANH Router.*
- 8-port ANH -- the back-panel COM3 slot (Figure 1-3). See *Installing an Adapter Module in a BayStack AN or ANH Router.*

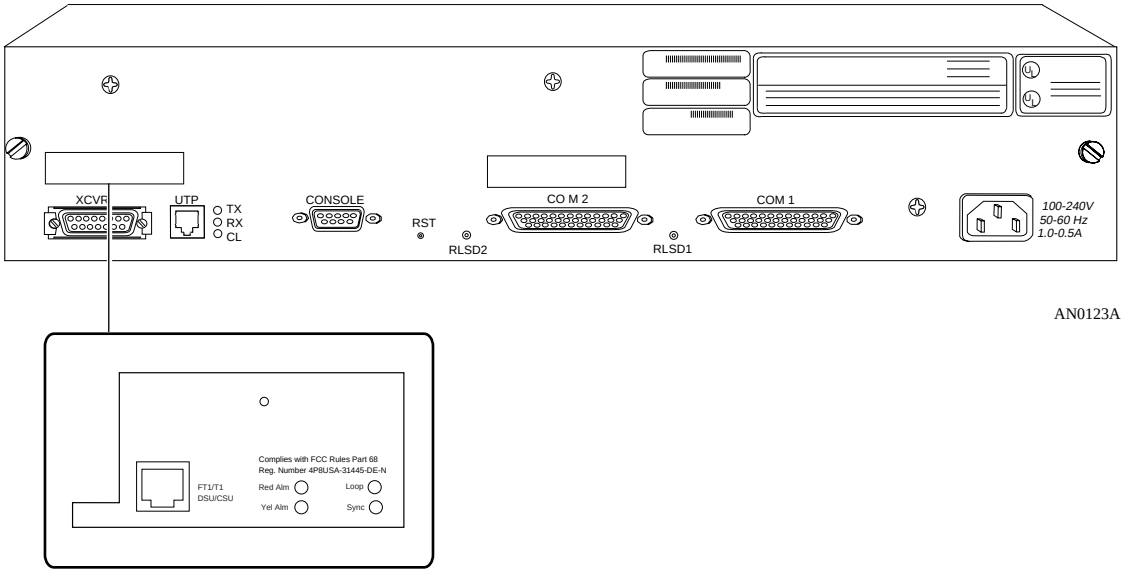

Figure 1-2. AN or 12-Port ANH T1/FT1 Adapter Module

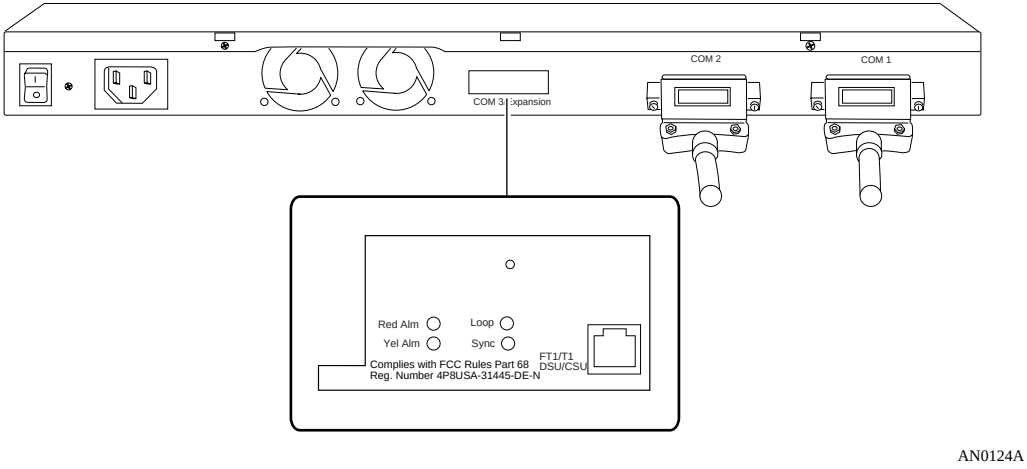

Figure 1-3. 8-Port ANH T1/FT1 Adapter Module

Completing Software Configuration

Once you have successfully installed the adapter module, complete the following software configuration tasks using instructions found in your BayRS documentation:

Configuration Task	Location of Instructions
Connect the AN/ANH to the network. Note that you cannot perform a Netboot or Directed Netboot operation using the T1/FT1 adapter module interface. The boot/startup methods you can use are Local Boot and EZ-Install.	One of the following: • *Installing and Operating BayStack AN and ANH Routers* • *Configuring BayStack Remote Access*
Modify the configuration file to add the T1/FT1 module and enable default software services.	One of the following: • *Configuring and Managing Routers with Site Manager* • *Using the Bay Command Console (BCC™)*
Configure T1 or FT1 services.	*Configuring WAN Line Services*

For the latest information, be sure to review the release notes and documentation change notice for your version of BayRS software.

Interpreting LEDs

The T1/FT1 adapter module LEDs (Figure 1-4) will blink on and off during diagnostic testing, but they will not stay on to indicate data transfer until you have configured and enabled T1/FT1 software services.

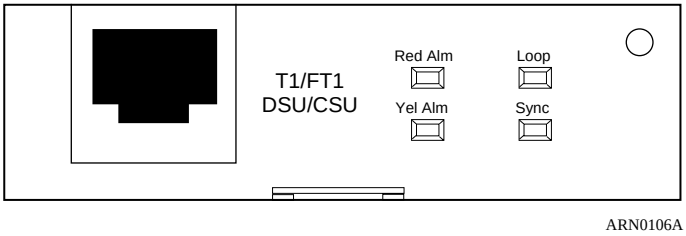

Figure 1-4. T1/FT1 Adapter Module LEDs

Table 1-2 describes the function of each T1/FT1 LED.

Table 1-2. T1/FT1 LEDs

Label	Color	Meaning
Red Alm	Red	Lights when the T1 port is in a red alarm state.
Yel Alm	Amber	Lights when the DSU/CSU has received a yellow alarm from the T1 network.
Loop	Amber	Lights when the T1 interface is placed in loopback mode.
Sync	Green	Lights when the T1 port is synchronized with the T1 network.

Chapter 2
Using the T1/FT1 Adapter Module in a BayStack ARN Router

This chapter supplements *Installing and Operating BayStack ARN Routers.* Follow the hardware installation steps in that manual, then refer to this document for information specific to the T1/FT1 adapter module.

Verifying ARN Router Requirements

Table 2-1 shows the minimum boot and diagnostic programmable read-only memory (PROM) code required for the T1/FT1 adapter modules.

Table 2-1. PROM Diagnostic and Boot Code for ARN Routers

Code Type	Minimum Version	Directory	File Name
Boot	1.18	arn_proms	arnboot.exe
Diagnostic	2.00	arn_proms	arndiag.exe

For information on upgrading PROM, see the BayRS *Upgrading Routers* guide.

Attaching Cables

Connect the T1 communication device cable to the RJ-48C connector on the installed T1/FT1 adapter module (Figure 2-1).

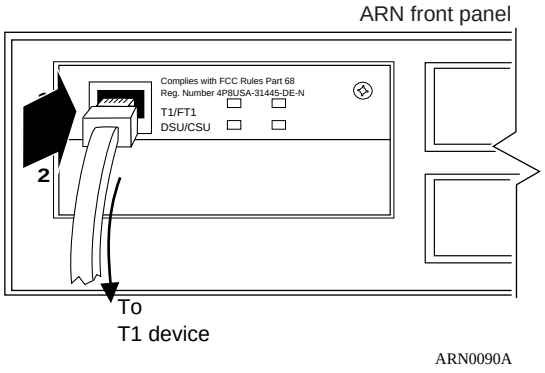

Figure 2-1. T1/FT1 Adapter Module Cable Connection

You install the T1/FT1 adapter module in one of the two front-panel WAN adapter module slots (Figure 2-1). See *Installing and Operating BayStack ARN Router*s.

Completing Software Configuration

Once you have successfully installed the adapter module, complete the following software configuration tasks using instructions found in your BayRS documentation:

Configuration Task	**Location of Instructions**
Connect the ARN to the network. Note that you cannot perform a Netboot or Directed Netboot operation using the T1/FT1 adapter module interface. The boot/ startup methods you can use are Local Boot and EZ-Install.	One of the following: • *Installing and Operating BayStack ARN Routers* • *Configuring BayStack Remote Access*
Modify the ARN configuration file to add the T1/FT1 module and enable default software services.	One of the following: • *Configuring and Managing Routers with Site Manager* • *Using the Bay Command Console (BCC)*
Configure T1 or FT1 services.	*Configuring WAN Line Services*

For the latest information, be sure to review the release notes and documentation change notice for your version of BayRS software.

Interpreting LEDs

The T1/FT1 adapter module LEDs (Figure 2-2) will blink on and off during diagnostic testing, but they will not stay on to indicate data transfer until you have configured and enabled T1/FT1 software services.

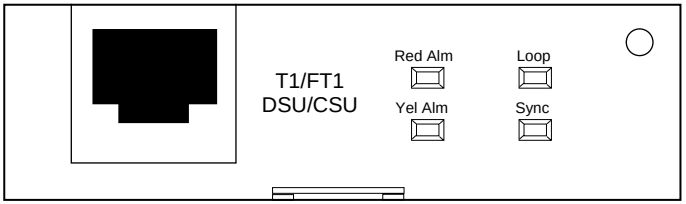

Figure 2-2. ARN T1/FT1 Adapter Module LEDs

Table 2-2 describes the function of each T1/FT1 LED.

Table 2-2. T1/FT1 LEDs

Label	Color	Meaning
Red Alm	Red	Lights when the T1 port is in a red alarm state.
Yel Alm	Amber	Lights when the DSU/CSU has received a yellow alarm from the T1 network.
Loop	Amber	Lights when the T1 interface is placed in loopback mode.
Sync	Green	Lights when the T1 port is synchronized with the T1 network.

Chapter 3
Using the T1/FT1 Adapter Module in the Passport 5430 Multiservice Access Switch

This chapter supplements *Installing and Operating the Passport 5430 Multiservice Access Switch.* Follow the hardware installation steps in that manual, then refer to this document for information specific to the T1/FT1 adapter module.

WAN Adapter Module Placement Considerations

When installing WAN adapter modules in the Passport 5430 module slots, note the following:

- Each WAN adapter module you install is automatically assigned a circuit, even if the WAN adapter module has not been configured. This prevents disruption of active circuits if you reconfigure the module at a later time.
- You can configure a total of four circuits.
- An ISDN BRI adapter module has the resources to bring up a second B channel (thus using two circuits).

  Other supported WAN adapter modules (listed below) use only one circuit.

  -- 56/64K DSU/CSU

  -- FE1/E1 DSU/CSU

  -- FT1/T1 DSU/CSU

  -- Serial

  -- V.34 modem

If you use two ISDN BRI adapters and no other WAN adapter module, both ISDN BRI modules have two circuits available for use and therefore each can bring up two B channels plus one D channel.

If you use two ISDN BRI adapters and another WAN adapter module, the number of circuits available to WAN adapters stays the same while the total number needed by the WAN adapters increases by one. This affects the number of B channels the ISDN BRI adapters can bring up, as shown in Table 3-1.

Table 3-1. WAN Adapter Combinations

	Module 3	**Module 4**	**Module 5**
Combination 1	56/64K, FE1/E1, FT1/T1 Serial, or V.34 modem	ISDN BRI -- Two B channels plus one D channel	ISDN BRI -- One B channel plus one D channel
Combination 2	ISDN BRI -- Two B channels plus one D channel	56/64K, FE1/E1, FT1/T1 Serial, or V.34 modem	ISDN BRI -- One B channel plus one D channel
Combination 3	ISDN BRI -- Two B channels plus one D channel	ISDN BRI -- One B channel plus one D channel	56/64K, FE1/E1, FT1/T1 Serial, or V.34 modem

Attaching Cables

Connect the T1 communication device cable to the RJ-48C connector on the installed T1/FT1 adapter module (Figure 3-1).

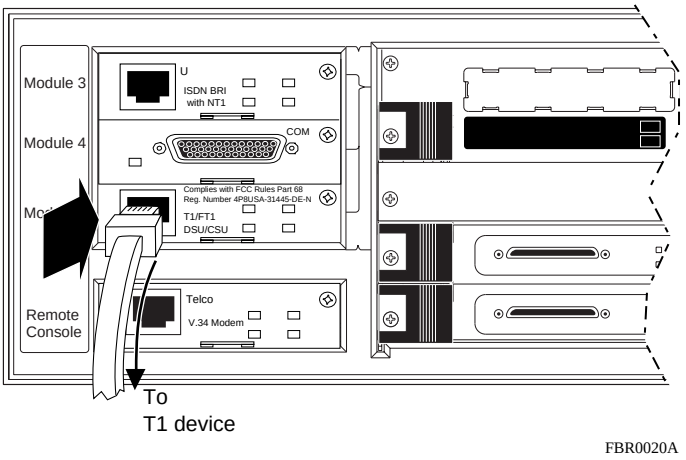

Figure 3-1. T1/FT1 Adapter Module Cable Connection

You install the T1/FT1 adapter module in one of the three front-panel Module slots (Figure 3-1). See *Installing and Operating the Passport 5430 Multiservice Access Switch.*

Note: The slot labeled Remote Console is reserved for the V.34 modem adapter module. Do not install the T1/FT1 adapter module in the Remote Console slot.

Completing Software Configuration

Once you have successfully installed the adapter module, complete the following software configuration tasks using instructions found in your BayRS documentation:

Configuration Task	Location of Instructions
Modify the configuration file to add the T1/FT1 module and enable default software services.	One of the following: • *Configuring and Managing Routers with Site Manager* • *Using the Bay Command Console (BCC)*
Configure T1 or FT1 services.	*Configuring WAN Line Services*

For the latest information, be sure to review the release notes and documentation change notice for your version of BayRS software.

Interpreting LEDs

The T1/FT1 adapter module LEDs (Figure 3-2) will blink on and off during diagnostic testing, but they will not stay on to indicate data transfer until you have configured and enabled T1/FT1 software services.

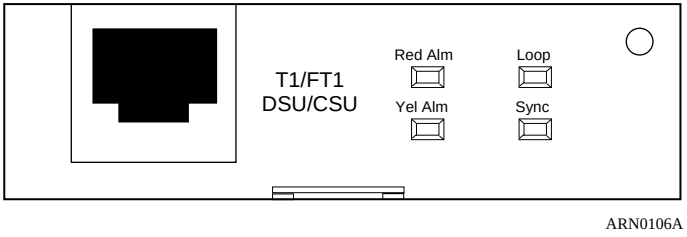

Figure 3-2. Passport 5430 T1/FT1 Adapter Module LEDs

Table 3-2 describes the function of each T1/FT1 LED.

Table 3-2. T1/FT1 LEDs

Label	Color	Meaning
Red Alm	Red	Lights when the T1 port is in a red alarm state.
Yel Alm	Amber	Lights when the DSU/CSU has received a yellow alarm from the T1 network.
Loop	Amber	Lights when the T1 interface is placed in loopback mode.
Sync	Green	Lights when the T1 port is synchronized with the T1 network.

Chapter 4
Using the T1/FT1 Adapter Module in a Passport 2430 Multiservice Access Switch

This chapter supplements *Installing and Operating the Passport 2430 Multiservice Access Switch.* Follow the hardware installation steps in that manual, then refer to this document for information specific to the T1/FT1 adapter module.

Attaching Cables

Connect the T1 communication device cable to the RJ-48C connector on the installed T1/FT1 adapter module (Figure 4-1).

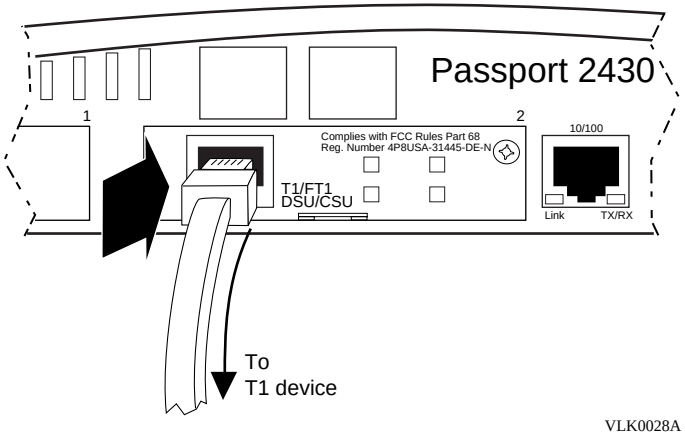

Figure 4-1. T1/FT1 Adapter Module Cable Connection

You install the T1/FT1 adapter module in one of the two rear-panel slots on the Passport 2430 (Figure 4-1). See *Installing and Operating the Passport 2430 Multiservice Access Switch*.

Completing Software Configuration

Once you have successfully installed the adapter module, complete the following software configuration tasks using instructions found in your BayRS documentation:

Configuration Task	**Location of Instructions**
Connect the Passport 2430 to the network. Note that you cannot perform a Netboot or Directed Netboot operation using the T1/FT1 adapter module interface. The boot/startup methods you can use are Local Boot and EZ-Install.	One of the following: • *Installing and Operating the Passport 2430 Multiservice Access Switch* • *Configuring BayStack Remote Access*
Modify the configuration file to add the T1/FT1 module and enable default software services.	One of the following: • *Configuring and Managing Routers with Site Manager* • *Using the Bay Command Console (BCC)*
Configure T1 or FT1 services.	*Configuring WAN Line Services*

For the latest information, be sure to review the release notes and documentation change notice for your version of BayRS software.

Interpreting LEDs

The T1/FT1 adapter module LEDs (Figure 4-2) will blink on and off during diagnostic testing, but they will not stay on to indicate data transfer until you have configured and enabled T1/FT1 software services.

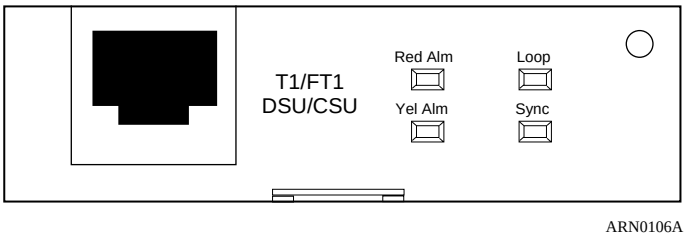

Figure 4-2. Passport 2430 T1/FT1 Adapter Module LEDs

Table 4-1 describes the function of each T1/FT1 LED.

Table 4-1. T1/FT1 LEDs

Label	Color	Meaning
Red Alm	Red	Lights when the T1 port is in a red alarm state.
Yel Alm	Amber	Lights when the DSU/CSU has received a yellow alarm from the T1 network.
Loop	Amber	Lights when the T1 interface is placed in loopback mode.
Sync	Green	Lights when the T1 port is synchronized with the T1 network.